

TABLE OF CONTENTS

Personnel	v
Publications and Reports	xiv
Introduction	xviii

GENERAL PHYSICS

I.	Molecular Beams	1
	Calculation of the Cross Section for He^3 -Roton Scattering in Superfluid Helium	1
II.	Microwave Spectroscopy	9
	Work Completed	9
	Electrical Noise in Superconducting Films	9
III.	Radio Astronomy	11
	Studies of Water-Vapor Microwave Emission from Infrared Stars	11
IV.	Solid-State Microwave Electronics	13
	Low-Noise Intermediate-Frequency Amplifiers for 55-GHz Radiometers	13
V.	Gravitation Research	17
	Balloon Measurements of Far Infrared Background Radiation	17
	Electromagnetically Coupled Broadband Gravitational Antenna	54
VI.	Electrodynamics of Media	77
	Short Pulses Produced by Cavity Dumping of a CO_2 Transversely Excited Atmospheric (TEA) Laser	77
	Prediction of Gain in CO_2 TEA Lasers	79

PLASMA DYNAMICS

VII.	Plasmas and Controlled Nuclear Fusion	89
	Feedback Stabilization	89
	Investigation of a Plasma Gun	89
	High-Temperature Plasma Physics	94
	Plasma Instabilities Driven by a DC Electric Field	94

CONTENTS

VIII.	Applied Plasma Research	105
	Active Plasma Systems	105
	Effect of Obliqueness between Density Gradient and Magnetic Field on Resonance Cones near the Lower Hybrid Resonance	105
	Impedance of Electrostatic Couplers in an Inhomogeneous Plasma	109
	Plasma Effects in Solids	112
	Nonlinear Plasma Effects in Interactions with Acoustic Waves	112

COMMUNICATION SCIENCES AND ENGINEERING

IX.	Speech Communication	119
	Speech Sound Categorization within Sets by Children	119
	MITSYN: A Graphical Notation and System for the Interactive Computer-Aided Specification and Realization of Music and Speech Synthesis and Other (Digital) Signal Processing	123
	Speech Analysis by Linear Prediction	133
X.	Linguistics	143
	How to Apply Phonological Rules	143
XI.	Cognitive Information Processing	147
	New High-Speed Multiplier Design	147
XII.	Communications Biophysics	153
	Contourographic Display in Incorporating Hidden Lines	153
	Digital Matched Filter for Electrocardiograms	155
	Vectorcardiographic Display and Measurement System	159
	Cryoprotective Action of Dimethyl Sulphoxide (DMSO) on <u>Homarus</u> Axons	162
XIII.	Signal Processing	169
	Recent Advances in the Theory of Reconstructing Multidimensional Signals from Projections	169
	Transient Response of a Varactor-Controlled Oscillator	183
	Model for Low-Frequency Atmospheric Noise	186
Author Index		195